

Case of Using SCORM in the Cyber Home Learning System

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Korea Education and Research Information Service

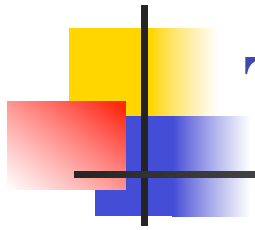


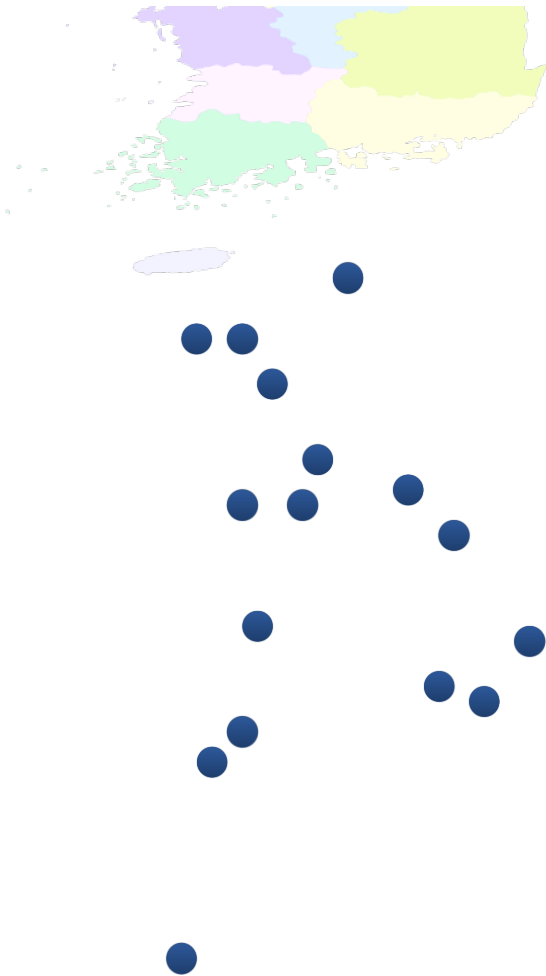
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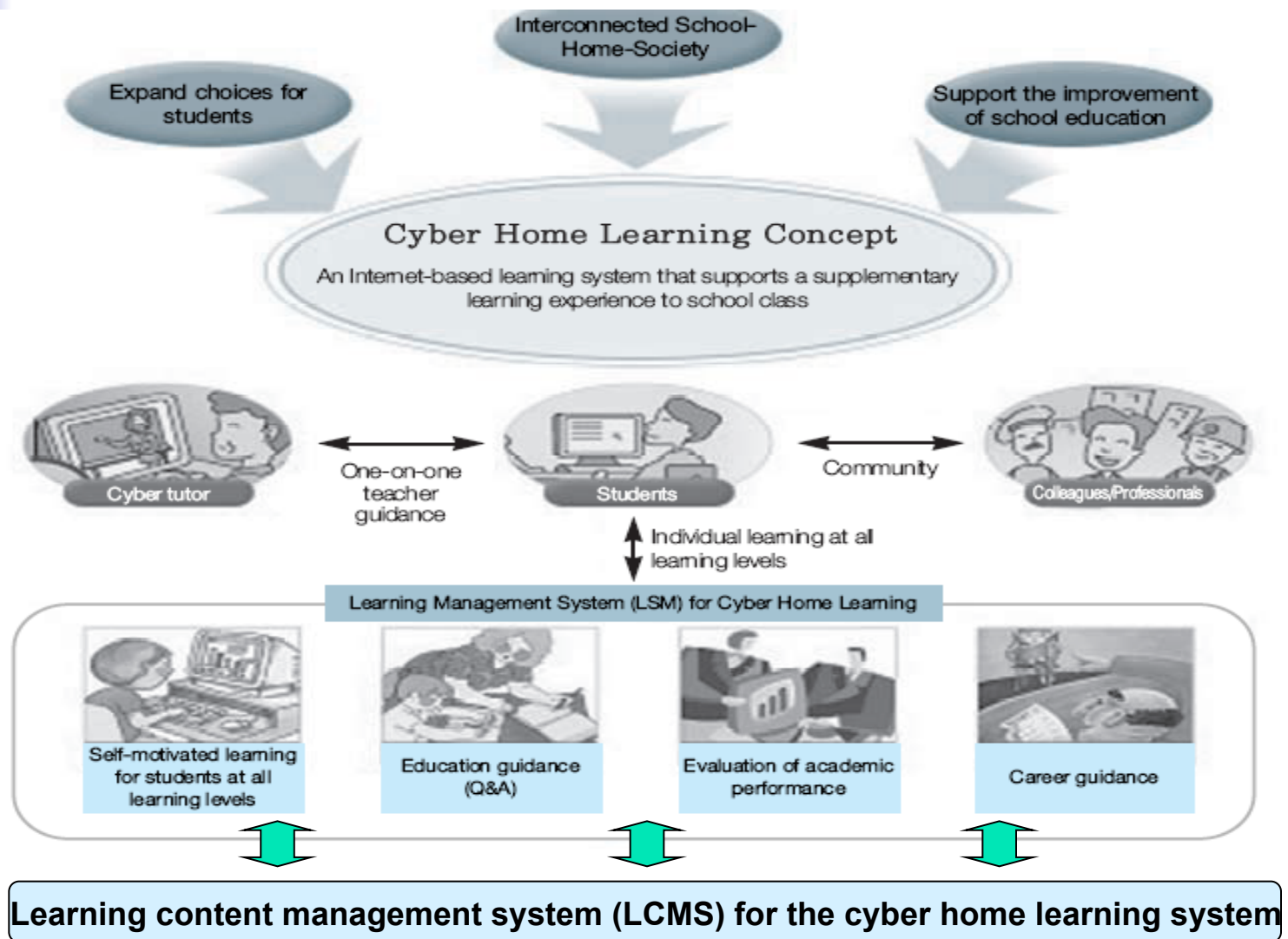
1. Overview of the Cyber Home Learning System (CHLS)

1. Overview of the Cyber Home Learning System (CHLS)



- ❑ A pilot e-Learning system developed jointly by the Ministry of Education and Human Resources (MoE), Korea Education and Research Information Service (KERIS), and 16 Metropolitan and Provincial Offices of Education (MPOE) since 2004
- ❑ First e-Learning system to be distributed nationwide and applied to the K-12 areas
- ❑ Currently, around 840,000 students using the distributed Cyber Home Learning System
- ❑ An organic system consisting of learning resources, human resources, and environmental resources to support the students and customize the online learning program according to their abilities
- ❑ Individualized teacher's help available to facilitate the progress of the students right at the convenience of their own homes and according to their own time and method, thanks to the Internet

1-1. Conceptual Diagram





1-2. Role Expectation for CHLS Development

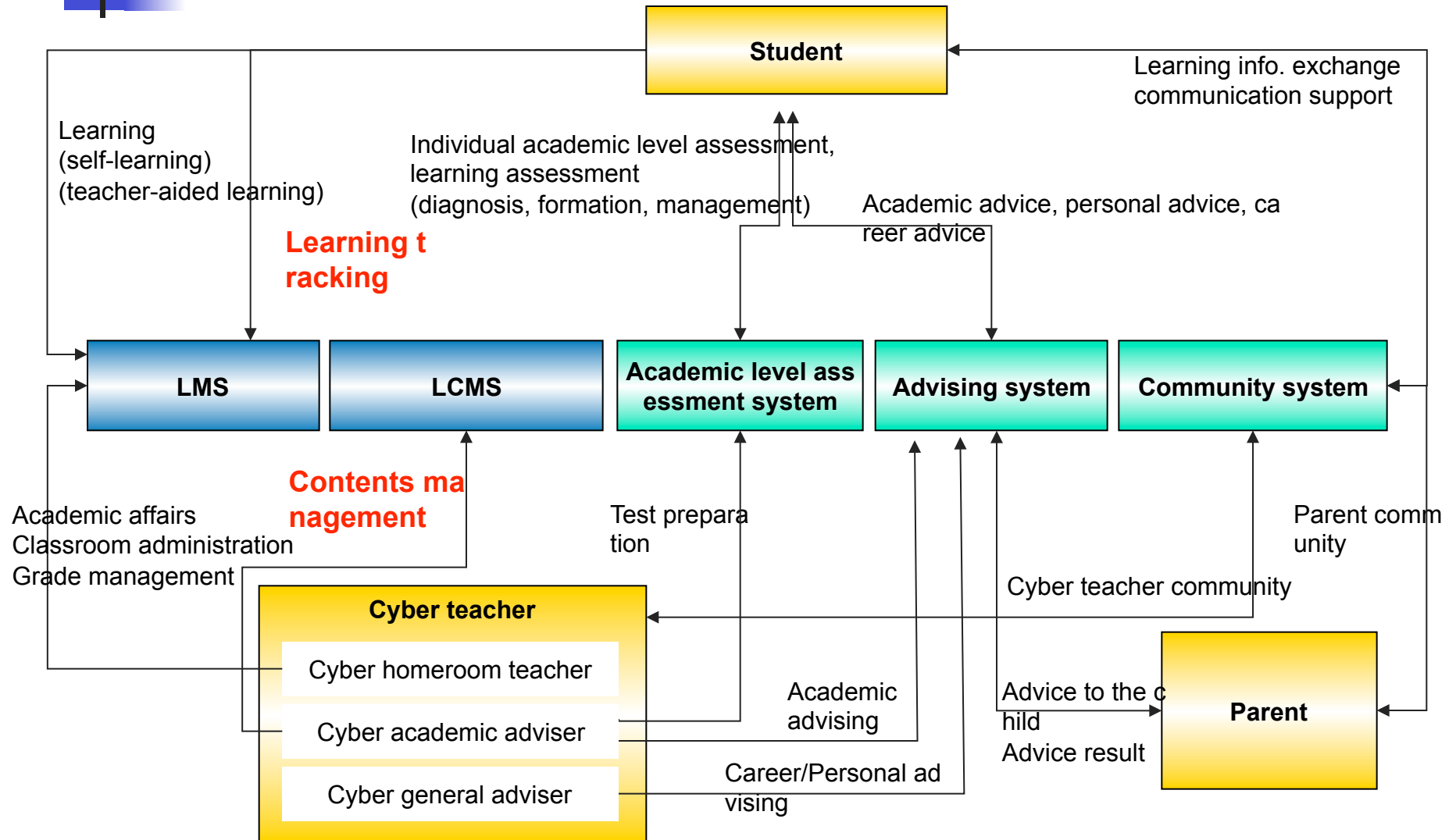
● KERIS

- Production and distribution of guidelines for Cyber Home Learning System development
 - ※ The guidelines are continuously revised to incorporate the new requirements of local governments.
- Development of standardized LCMS common functions, training of MPOE employees, and technical support
- Gateway for the management, sharing, and distribution of standardized contents

● MPOE

- Implements the LMS project in accordance with MPOE criteria (objective, budget, etc.)
- Linked with standardized, common LCMS functions
- Development of a system integrating the LMS/LCMS and CHLS of MPOE modules (assessment of academic level, advisory service, community, etc.)

1-3. Service System Workflow





1-4. Why SCORM 2004 Specification?

☐ **Content aggregation model (packaging)**

- To share and distribute KERIS's elementary school level contents in a standardized manner and middle school level contents as partially developed by each of the 16 MPOEs
 - ※ All 17 organizations are operating their own separate servers and learning management systems.

☐ **CMI data model and API instance**

- To deliver the partially developed contents in standardized format different from LMS and to maintain scoring consistency for the contents including assessment

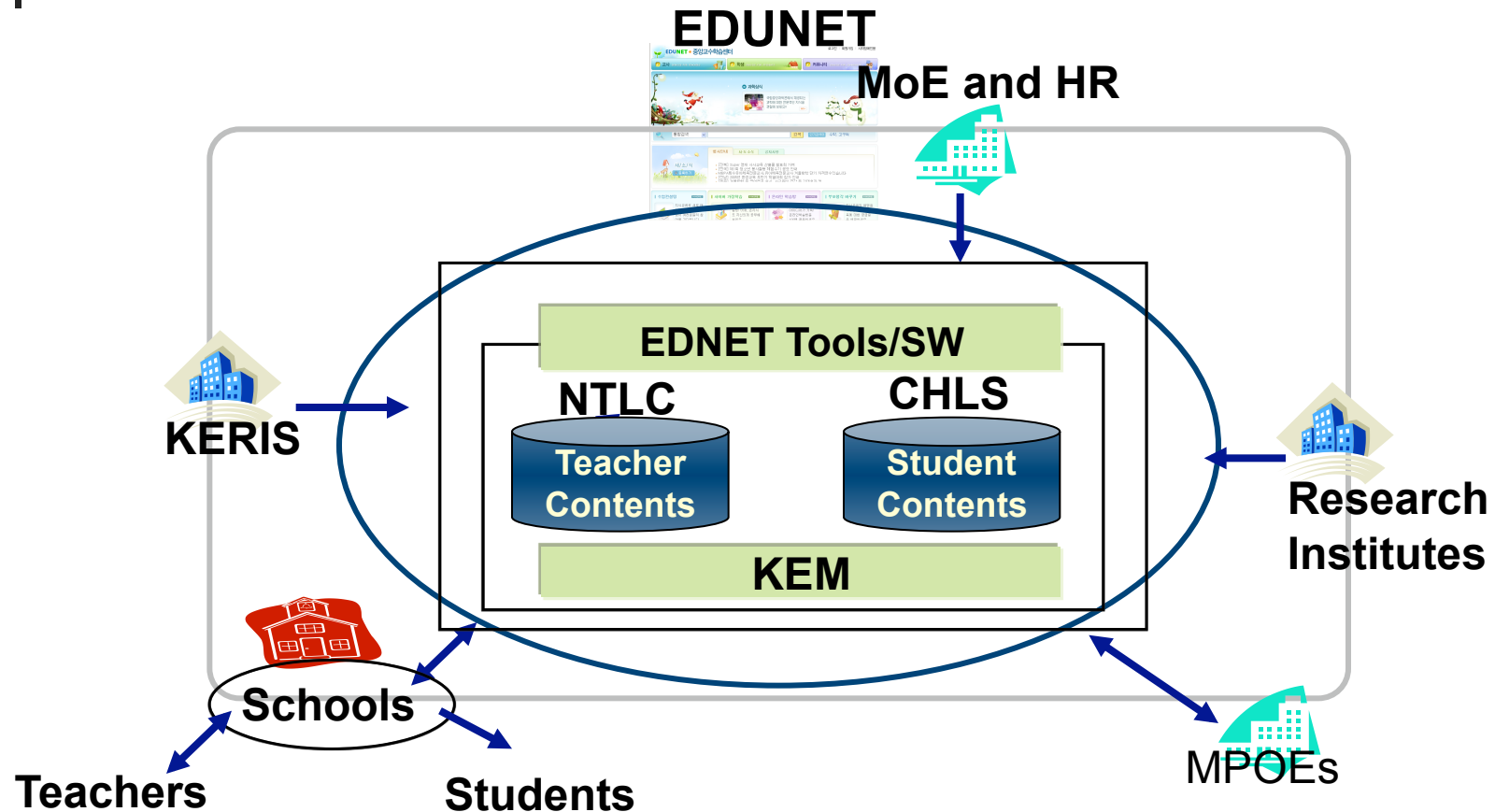
☐ **Sequencing and navigation rule**

- To ensure that the dynamic learning path of the contents developed in units of sharable content object (SCO) is consistently formed in all service providers in accordance with the original intention of the contents developer

☐ **Metadata for learning resources**

- KEM as Korea's standard Educational Metadata Specification, exhibiting compatibility with the LOM-based or DC-based metadata specification

1-5. Case Study of KEM Application (reference)

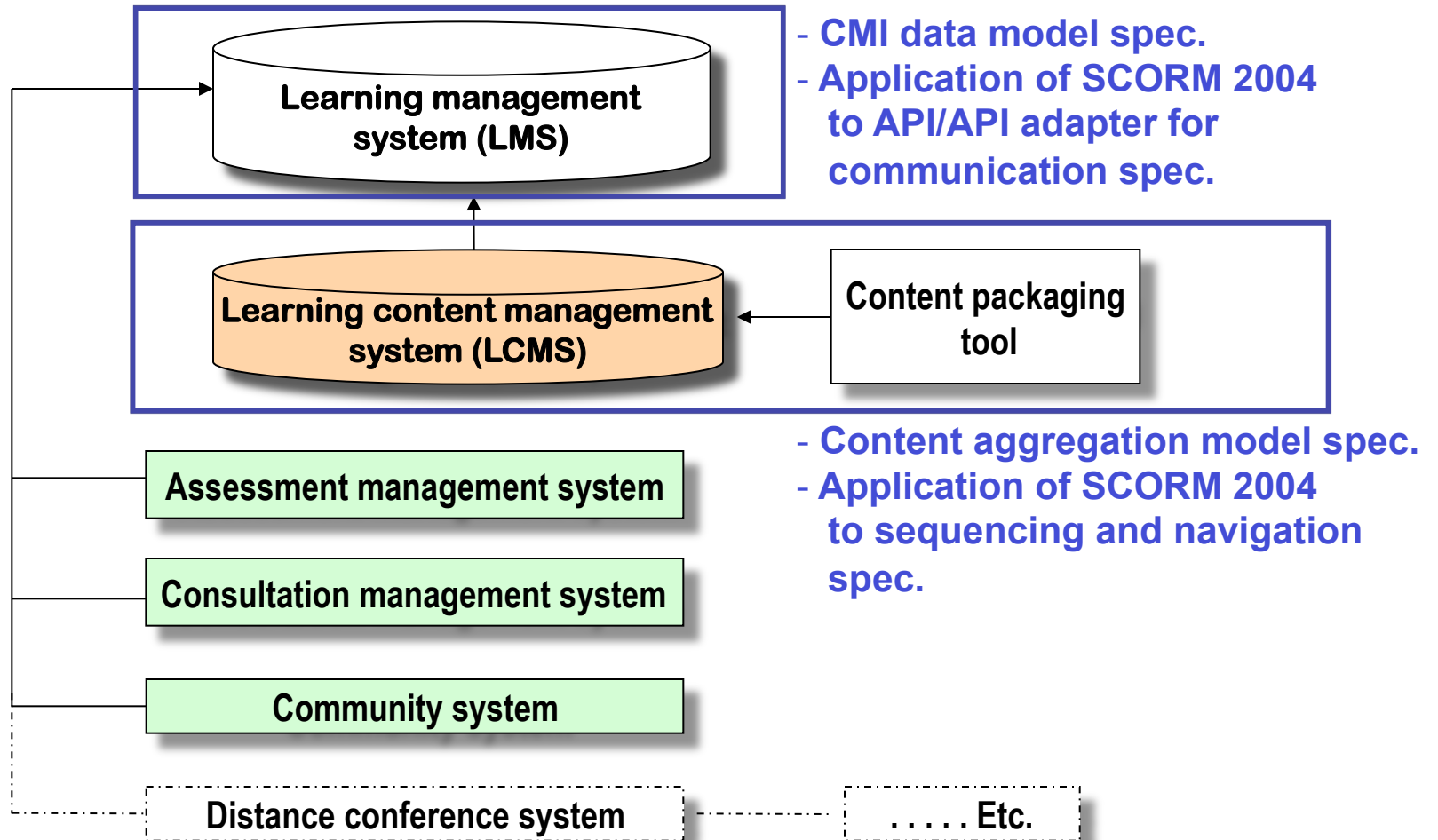


- **NTLC**: National Teaching-Learning Center services at the asset level
- **CHLS**: Cyber Home Learning System for students' services at the LO level



2. SCORM Application to CHLS

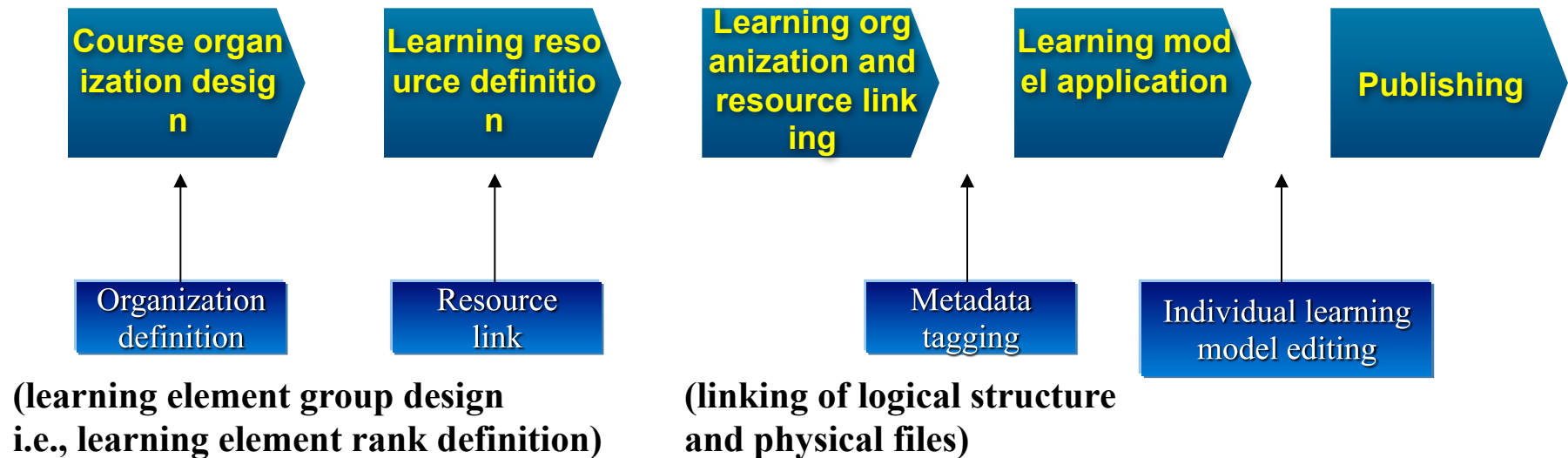
2. SCORM Specification Applied to CHLS



(*ref: KERIS's ISP report on the design and construction of Cyber Home Learning, 2004)

2-1. Content Aggregation Model (CAM) Application Process

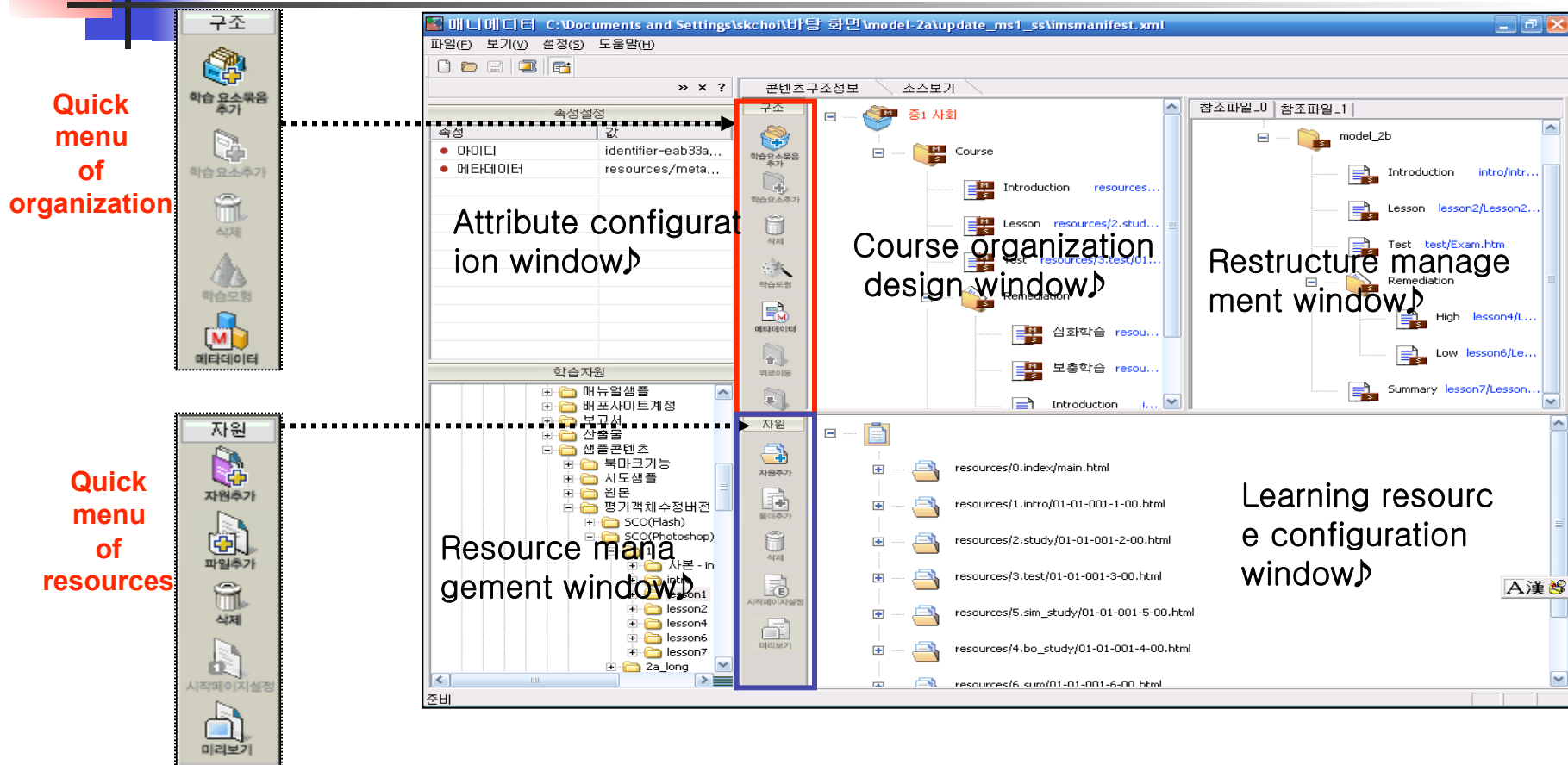
● Content packaging process



● Notes

- Metadata is commonly applied when prepared from either SCO (learning resource domain) or activity (course organization domain).
- UI is limited to **metadata editing only from the course organization design domain** and metadata entry only for "**organization**" and "**item**".

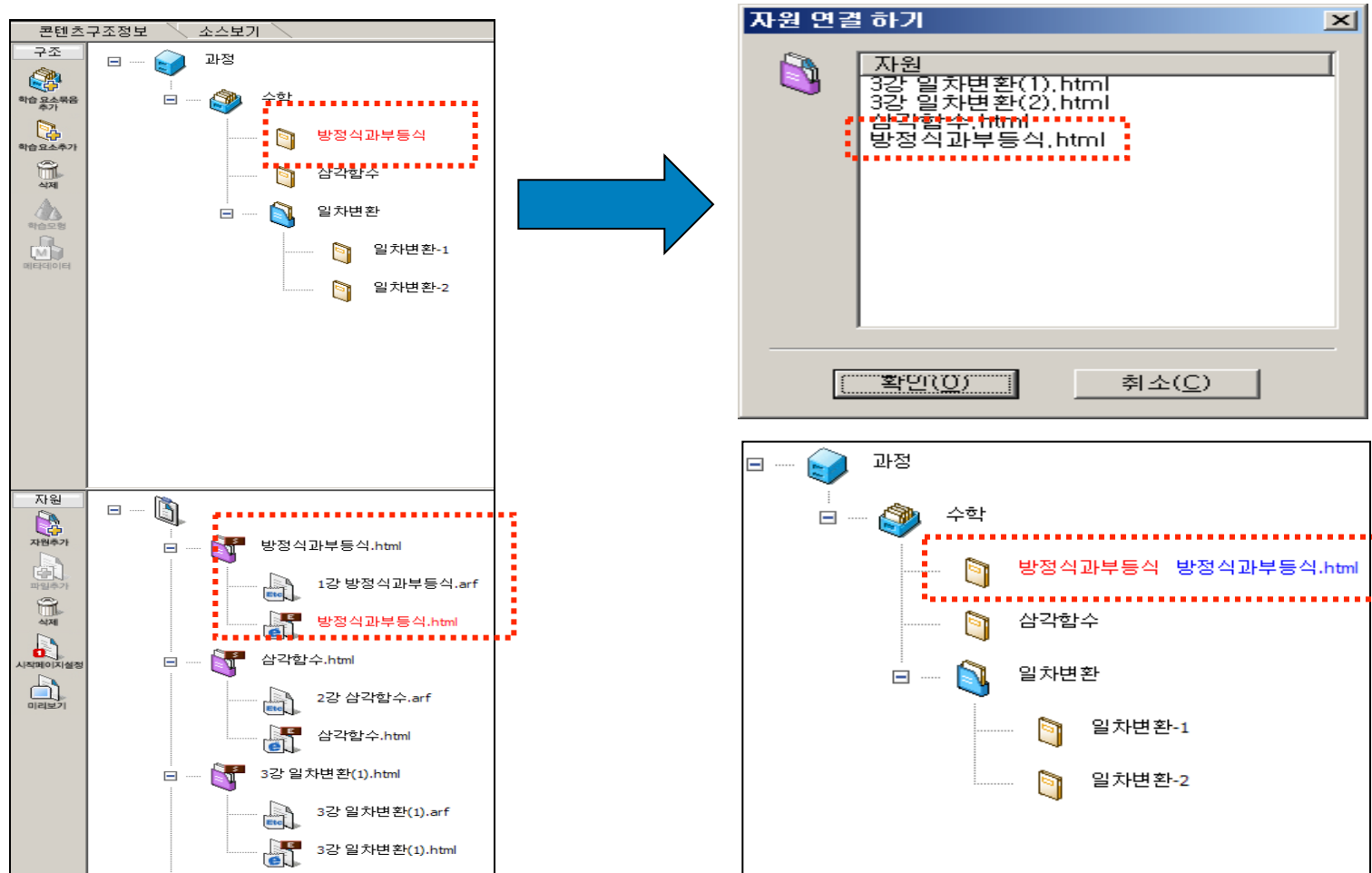
2-2. Content Packaging Tool (CAM)



- **Course structure design window:** Editing (add, delete, move, etc.) of learning object (rank definition)
- **Learning resource configuration window:** Physical file labeling and resource addition
- **Attribute configuration window:** Learning object and resource attribute editing
- **Resource management window:** Packaging root folder resource search and management (media, image, sound)

2-2. Content Packaging Tool (CAM)

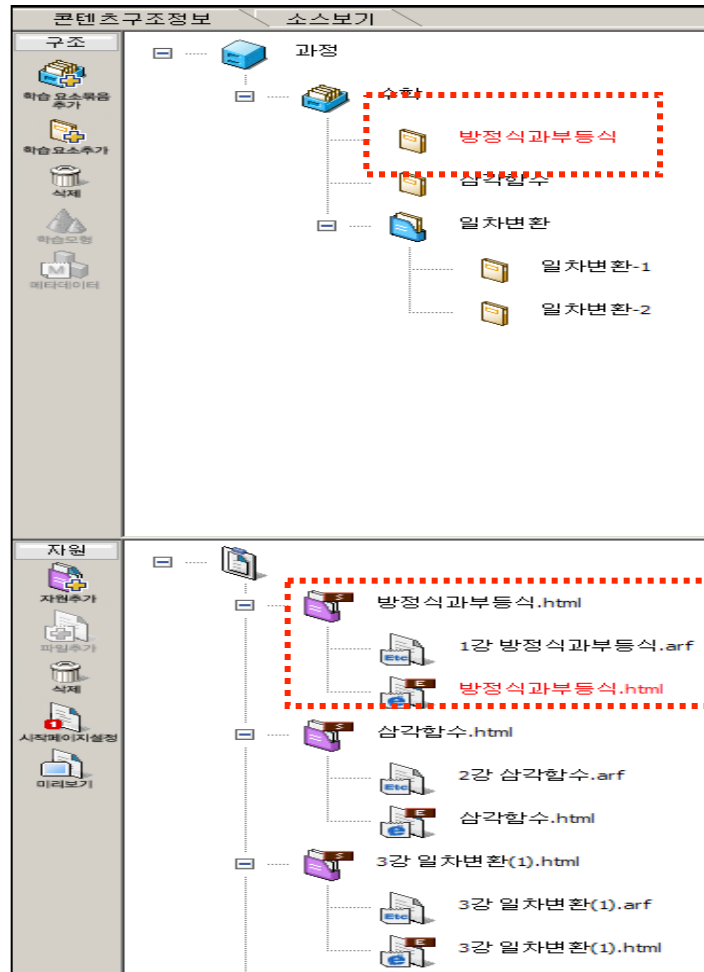
● Organization and resources linking (1)



Popup
window

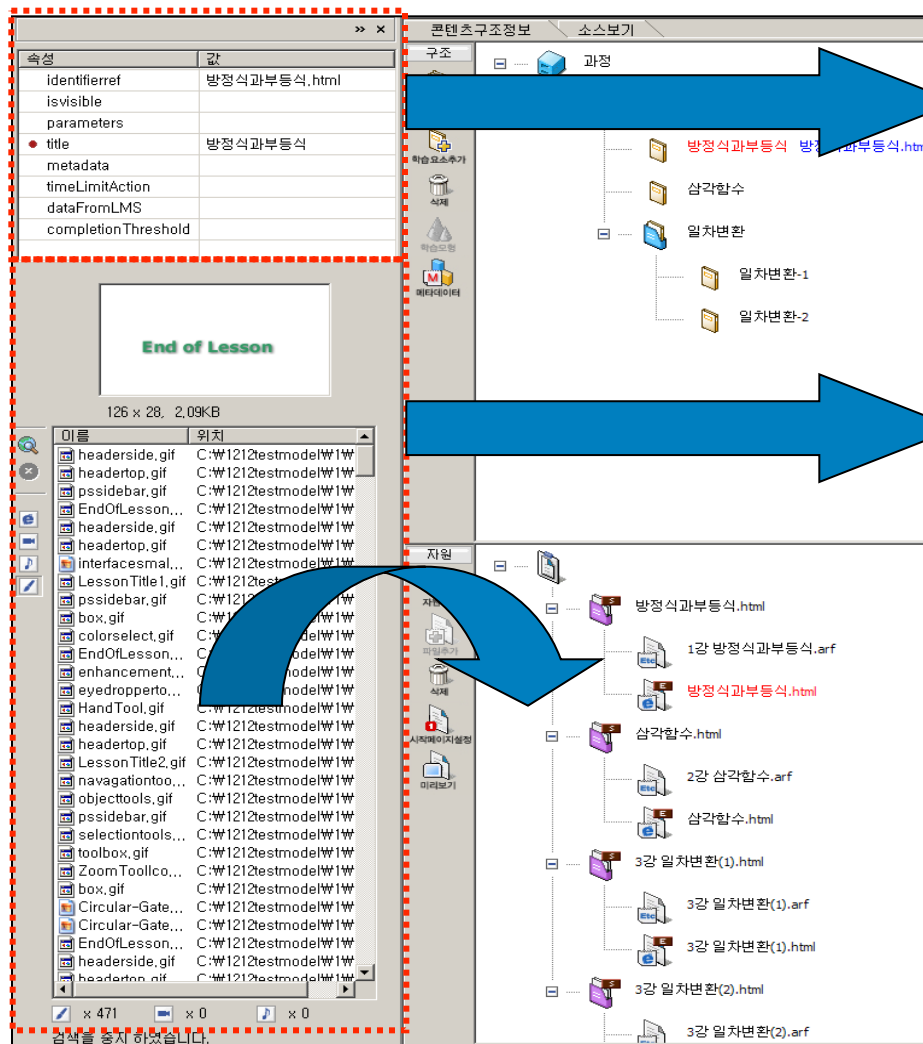
2-2. Content Packaging Tool (CAM)

● Organization and resources linking (2)



Drag & drop

2-2. Content Packaging Tool (CAM)



Edit properties

- Organization elements
- Resource elements

Resources management

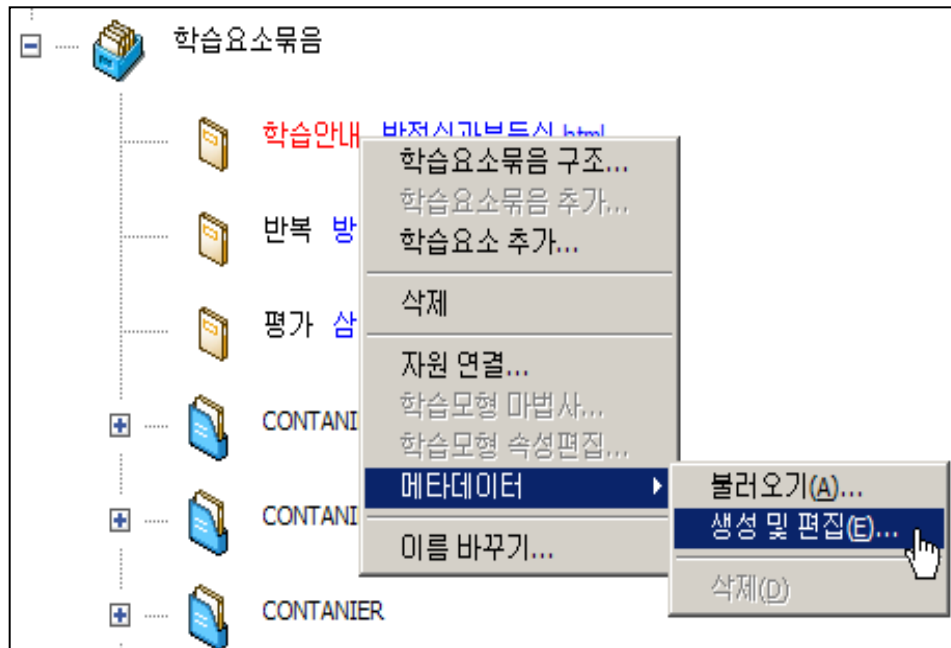
- Media, sound, image preview, etc.

Drag and drop

- Supports the drag and drop function from the resource management window to the property setting window

2-2. Content Packaging Tool (CAM)

- Popup menu for metadata editing



- Course level
- Lesson level
- SCO level

※The mandatory elements (title, description, classification, etc) of the metadata must be entered in detail since they can be referred to when the course is opened from LMS or retrieved by LCMS.

2-2. Content Packaging Tool (CAM)

● Metadata editing display (Mandatory elements)

- Initially, only the basic (mandatory) elements are displayed (other elements are automatically configured with default values).
- To edit other elements (mandatory + optional) elements, click View All.

Shows all metadata elements

2-2. Content Packaging Tool (CAM)

● Metadata editing display (all elements)

- This display divides all elements into 9 categories.
- Clicking View Mandatory Elements causes the initial screen to be displayed.

Shows only the
mandatory metadata element

s

Mandatory elements
(displayed in red)



2-2. Content Packaging Tool (CAM)

● Efforts toward content aggregation model application

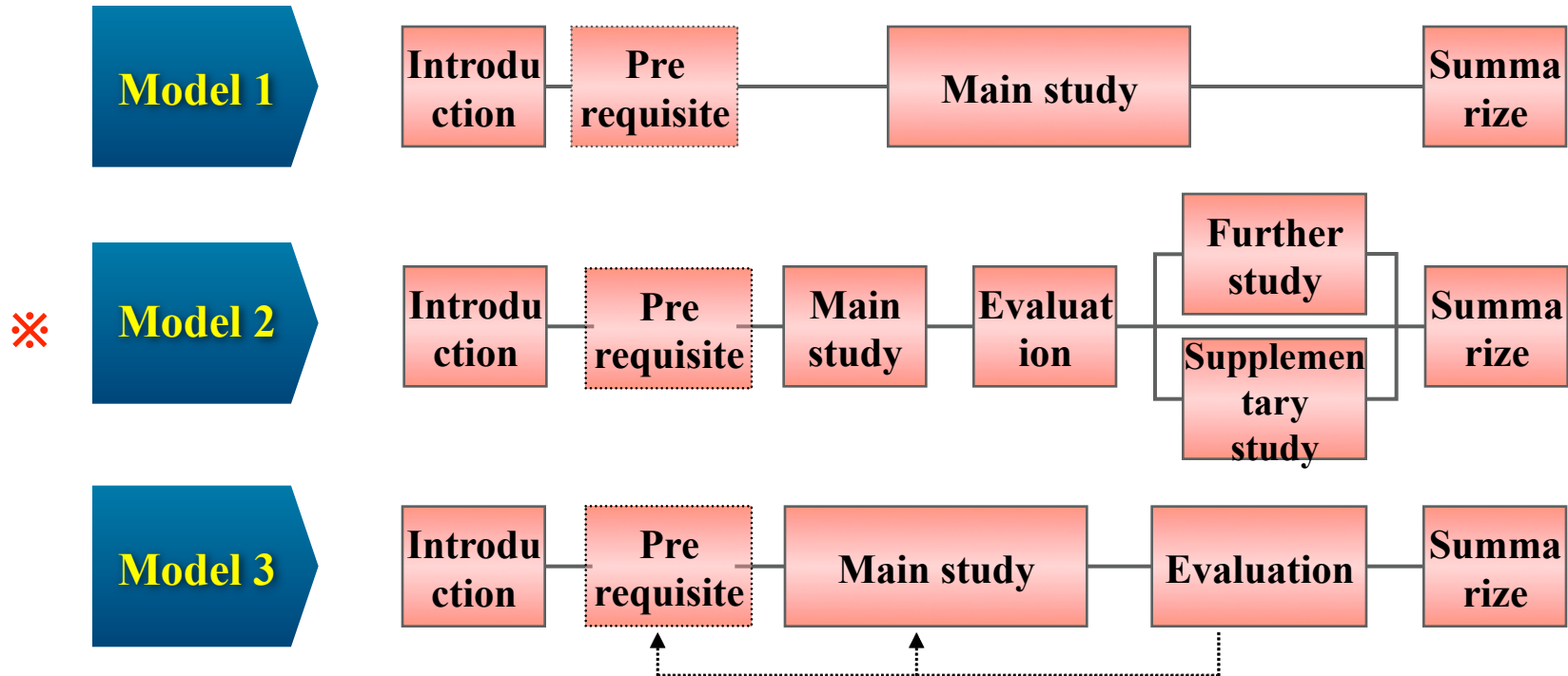
- Development of user interface to facilitate CAM application even without full knowledge of the SCORM specification not well known
- Shorter work duration and improved learning effect by providing CAM templates
- Emphasis on the need for standardization through regular education/training programs for MPOE officials, developers, and operators

● Difficulties in content aggregation model application

- Determining the aggregation level (granularity) from the design phase requires longer time and trial and error
 - ※ Considering the development schedule and learning procedure, the first lecture (introduction , main study, evaluation, summarize, etc–, one hour) was classified as an SCO (learning activity) unit.
- Currently discussing how to satisfy the requirement to embed the RTE engine and conformance test tool in the content packaging tool

2-3. Model for Applying Sequencing and Navigation (SN)

- 3 content models applied to CHLS



- Branching type

- For Model 2 and Model 3, automatic branching by assessment score and selective branching by learner allowed; Model 2 is more widely used, however

2-4. Content Packaging Tool (SN)

Sequencing and navigation wizard

모형 선택

학습 모형을 선택합니다.

Model 1 (linear) → ☐ 기본학습

Model 2 (branch) → ☒ 심화·보충학습

Model 3 (remediation) → ☐ 반복학습

분기형태를 선택합니다.

☐ : 추가, 삭제, 수정가능 ☐ : 모형선택기준

☒ 자동분기 ☐ 선택분기

< 뒤로(B) 다음(N) > 취소 도움말

2-4. Content Packaging Tool (SN)

● SN template management

The screenshot displays the Content Packaging Tool (SN) interface with two windows open: '템플릿 저장' (Save Template) and '템플릿 열기' (Open Template).

템플릿 저장 (Save Template): This window shows a table of templates and a text area for saving a new template.

이름	구분	정보
모형-1	공통 템플릿	모형-1입니다.
모형-2	공통 템플릿	모형-2입니다.
모형-3	공통 템플릿	모형-3입니다.
모형-4	공통 템플릿	모형-4입니다.
모형-5	공통 템플릿	모형-5입니다.
기본학습모형	사용자 템플릿	기본학습모형입니다.
반복학습모형	사용자 템플릿	반복학습모형 자동분기 템플릿 입니다.(기준점수 60점, 반복회수 2회...
심화보충학...	사용자 템플릿	심화보충학습모형 자동분기 템플릿 입니다.

① Save template.

이름 :

정보 :

확인 취소

템플릿 열기 (Open Template): This window shows a table of templates and a text area for opening an existing template.

이름	구분	정보
모형-1	공통 템플릿	모형-1입니다.
모형-2	공통 템플릿	모형-2입니다.
모형-3	공통 템플릿	모형-3입니다.
모형-4	공통 템플릿	모형-4입니다.
모형-5	공통 템플릿	모형-5입니다.
기본학습모형	사용자 템플릿	기본학습모형입니다.
반복학습모형	사용자 템플릿	반복학습모형 자동분기 템플릿 입니다.(기준점수 60점, 반복회수 2회...
심화보충학...	사용자 템플릿	심화보충학습모형 자동분기 템플릿 입니다.

② Open template.

저장할 폴더 경로 :

확인 취소

2-4. Content Packaging Tool (SN)

- SN property management

Sequencing
property type
(rollup, objective, etc.)

Detail sequencing
property editing tab

시퀀싱정보 편집

학습 목표

추가 삭제

제어 모드

시퀀싱 규칙

제한 조건

롤업 규칙

학습목표

랜덤 학습환경

전달 제어

선택 제한

롤업 방식

기본 학습목표 설정

추가 학습목표 설정

☒ 기준점수를 초과하면 학습목표가 만족된다 0.59 (범위 : -1.0 ~ 1.0)

학습목표 ID : obj_module_226890ce-28fc-4ac7-8c33-89057f5122b4 생성(N)

학습 목표 추가(A) 학습 목표 제거(R)

obj_module_226890ce-28fc-4ac7-8c33-89057f5122b4

☒ 학습목표를 공유한다

☐ 공유 학습목표의 만족여부를 가져온다 ☒ 공유 학습목표에 만족여부를 저장한다

☐ 공유 학습목표의 평가점수를 가져온다 ☒ 공유 학습목표에 평가점수를 저장한다

공유 학습목표 ID : obj_module_0516eac7-6040-49e6-8387-5a60499a 생성(N)

MapInfo 추가(M) MapInfo 삭제(M)

공유 학습목표 ID	만족여부 읽기	만족여부 저장	평가점수 읽기
obj_module_0516eac7-6040-49e...	false	true	

확인 취소

2-4. Example of Learning Window by SN Standard (reference)

● Sample (model 2)

Previous SCO

Next SCO

LMS area

SCO area

Previous page in SCOs

Next page in SCOs

The screenshot shows a learning window titled '수학' (Mathematics). The main content area is titled '입체도형의 이해' (Understanding 3D shapes) and '각기둥과 각뿔' (Prisms and Pyramids). It contains text explaining the concept of prisms and pyramids, accompanied by three diagrams: '삼각뿔' (Triangular pyramid), '사각뿔' (Square pyramid), and '오각뿔' (Pentagonal pyramid). The interface includes a sidebar with navigation links, a top navigation bar with icons, and a footer with navigation buttons. Annotations highlight the LMS area, SCO area, and navigation controls.



2-4. Content Packaging Tool (SN)

● Efforts toward sequencing and navigation rule application

- Development of user interface to facilitate CAM application even without full knowledge of the SCORM specification not well known
- Shorter development period and improved learning effectiveness by providing SN templates
- Emphasis on the need for standardization through regular education/training programs for MPOE officials, developers, and operators

● Difficulties in sequencing and navigation rule application

- Cannot satisfy demand from the field to use auxiliary resources for K-12 contents
 - ※ For example, the syllabus, dictionary (e.g., foreign language subjects), and foreign language pronunciation correction tool are most often designed as auxiliary resources.
- Cannot satisfy demand from the field to include cooperative learning such as the bulletin board and discussion in on-cum-offline lecture or contents
- Cannot satisfy demand to improve the sequencing definition of the Manifest file for better efficiency (e.g., source code extended by the repeat count of remediation)

2-5. Conformance Test Tool

Conformance test for SCOs

Conformance test for KEM

Conformance test for Manifest

KERIS 한국교육학술정보원
KCREA EDUCATION & RESEARCH INFORMATION SERVICE

Sharable Content Object Reference Model 적합성 검사 도구
Version 1.0 (자가진단검증)

적합성 검사 도구

- 학습객체(SCO) 적합성 검사  검사시작
- 메타데이터 적합성 검사  검사시작
- 매니페스트 적합성 검사  검사시작

적합성 검사 도구 설명

학습객체(SCO) :
자체적으로 교수목표와 학습내용을 가지고 있는 최소 단위의 교육자원
학습 객체(Learning Object)는 학습 목표와 내용을 가지고 있는 독립적인 단위로 디지털 기술을 이용하여 만들어진 그 자체로도 학습할 수 있는 가장 작은 단위를 말한다.

메타데이터 :
교육자원의 속성 및 특성정보를 포함하고 있는 정보사용자의 검색을 도와 자원의 재사용성을 높임

매니페스트 :
매니페스트는 패키지의 콘텐츠에 대한 구조화된 목록만일 패키지가 최종사용자에게 전달될 의도라면, 콘텐츠가 구조화되어 있는 방법에 대한 정보도 포함한다

 학습객체 (SCO)와 매니페스트의 적합성검사는 ADL TestSuite의 검사기능을 적용하였습니다.

2-5. Conformance Test Tool

Conformance test menu

Log of the conformance test result

Step in the conformance test

KERIS 한국교육학술정보원
Sharable Content Object Reference Model 적합성 검사 도구

학습객체(SCO) | 메타데이터 | 매니페스트 | 도움말 | 홈

로그 저장 | 주석 추가 | 기호 설명

Log of the conformance test result

알아두기

수행 지침

검사를 시작하기 전에 검사를 수행 해야 할 메타데이터 XML 문서에 접근할 수 있는지 확인을 해야 한다.

아래의 단계에 맞추어 검사를 완료하십시오.

테스트가 진행되는 동안 검사의 진행상황과 상태를 나타내는 메시지는 우측의 검사 로그 프레임에 기록이 될 것이다. 그러므로 언제나 혹은 검사 완료 후 로그를 프린트 할 수 있다.

메타데이터 적합성 검사

단계	수행지점
1/4	<p>검사를 수행할 메타데이터 파일을 식별하기 위한 정보를 입력하십시오:</p> <p>▶ 메타데이터 문서명: <input type="text"/></p> <p>▶ 메타데이터 문서 버전/배포 번호: <input type="text"/></p> <p>▶ 메타데이터 개발업체명/개발자명: <input type="text"/></p> <p>계속 ></p>

KERIS 한국교육학술정보원
Sharable Content Object Reference Model 적합성 검사 도구

현재 사용하시는 OS "Windows XP"는 지원된다

현재 사용하시는 자바 실행환경 "1.4.2_02"은 지원된다



2-5. Conformance Test Tool

- **Efforts toward conformance test tool application**

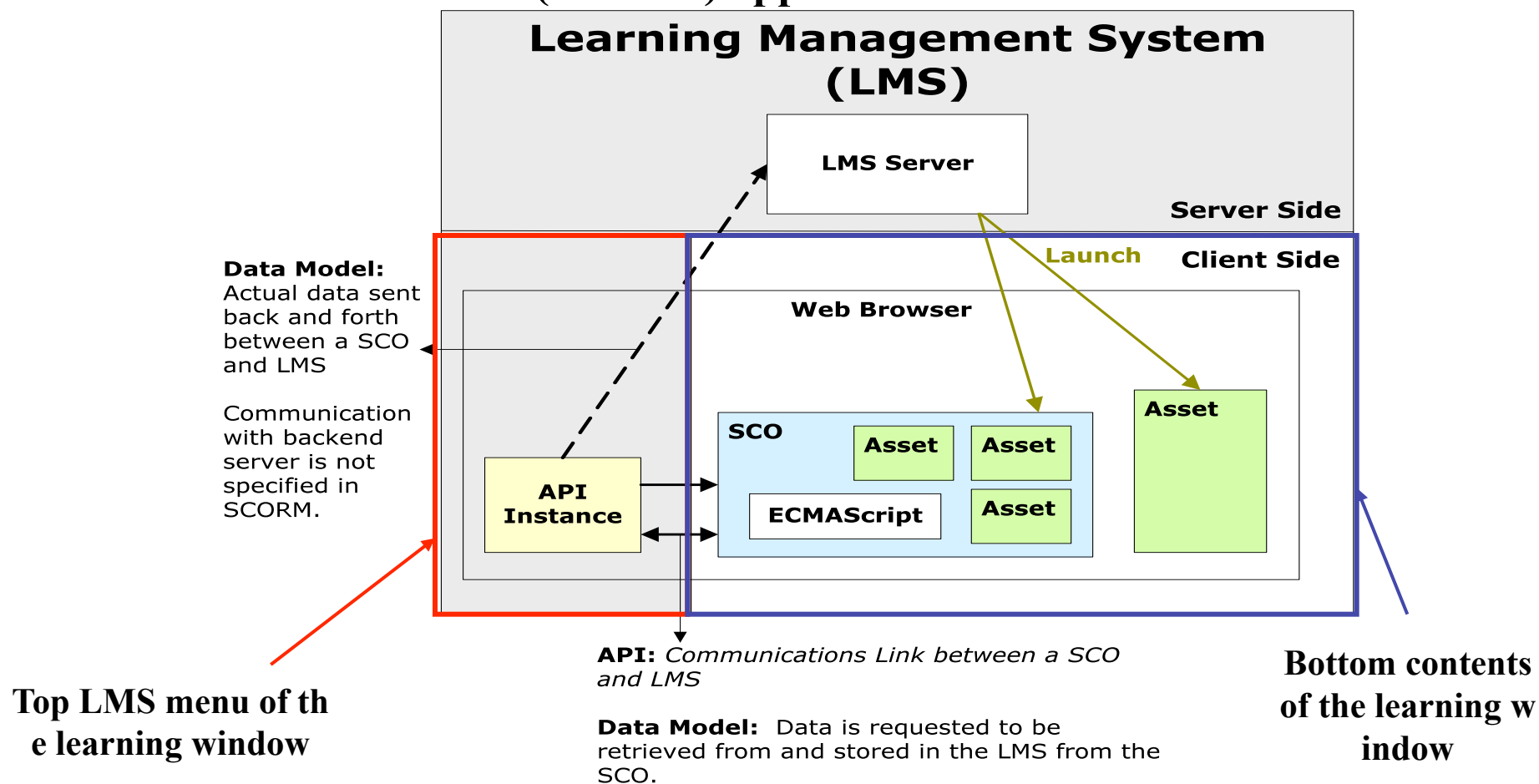
- Development of user interface to facilitate CAM application even without full knowledge of the SCORM specification not well known
- Education/training to emphasize that the conformance test is a prerequisite to seamless contents sharing and distribution
- Regular education/training programs for MPOE officials, developers, and operators

- **Difficulties in sequencing and navigation rule application**

- Field demanding the conformance test tool for communicating with LMS such as the test suite distributed by ADL, although its localization has yet to be started
- Since operating only under the JDK 1.4.2 version, demand for improvement in its use without the need to install JDK by supplying the tool with embedded JRE

2-6. Data Model and API (instance)

● Data model and API (instance) application



<Photo source: SCORM Run-Time Environment version 1.3, ADL (2004)>

2-6. Data Model and API (instance)

● Sample of learning window with data model and API (instance)

LMS area frame

The data model and sample code (HTML template window) with SCORM API are provided to MPOE for learner tracking and communication with LMS.

※ The sequencing and navigation instance is also included in the LMS area frame.

Contents area frame



2-6. Data Model and API (instance)

● Efforts toward data model and API (instance) application

- Development of user interface to facilitate CAM application even without full knowledge of the SCORM specification not well known
- Shorter development period and improved learning effectiveness by providing the HTML template window for data model and API (instance)
- Regular education/training programs for MPOE officials, developers, and operators

● Difficulties in data model and API (instance) application

- Improvement project ongoing as of 2005 to address the problem of LMS API instance performance deterioration in case of the sudden influx of simultaneous users
- Effort drastically increased to satisfy the additional requirements for utilizing cooperative learning and auxiliary resource since data models must be added

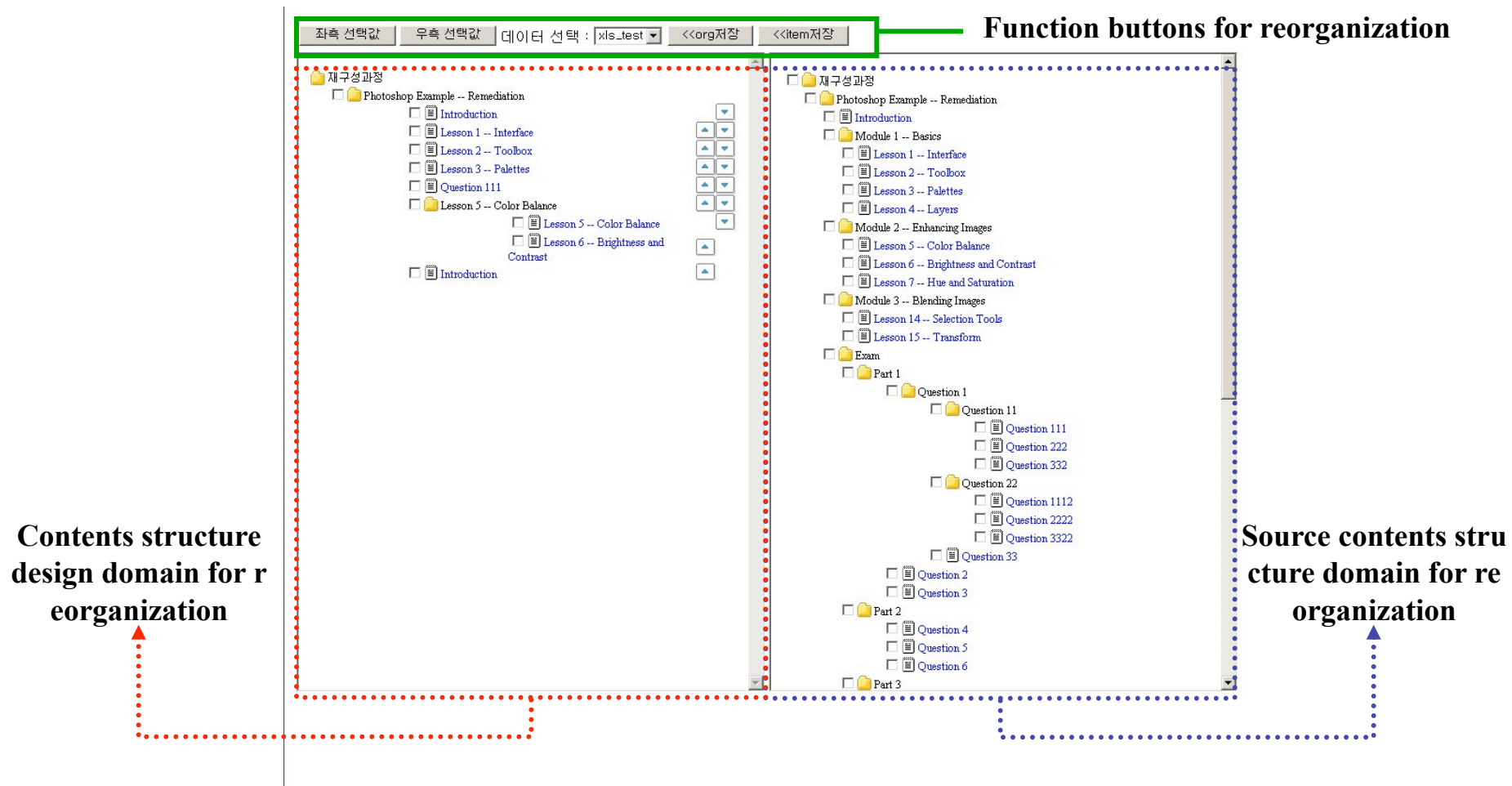
2-7. Learning Contents Management System (LCMS)

- **LCMS development and distribution (open source)** ※Key function for linking with LMS



2-7. Learning Contents Management System (LCMS)

● LCMS screen sample (reorganization)





2-7. Learning Contents Management System (LCMS)

- **Efforts toward LCMS application with SCORM specification**
 - Open source provided to facilitate independent linking with LMS per MPOE
 - Sample code provided to shorten the development time for linking LCMS and LMS and to improve learning effectiveness
 - Regular education/training programs for MPOE officials, developers, and operators

- **Difficulties in LCMS application with SCORM specification**
 - When the remote resource is defined as SCO inside the Manifest, programs sometimes failing to run because of an MS Explorer security problem
 - Not enough time to respond to additional requirements such as contents reorganization (reorganization function applied as a pilot system in 2004 and included in the improvement project in 2005)



3. Proposed SCORM Specification Improvement for CHLS



3. SCORM Improvement for CHLS

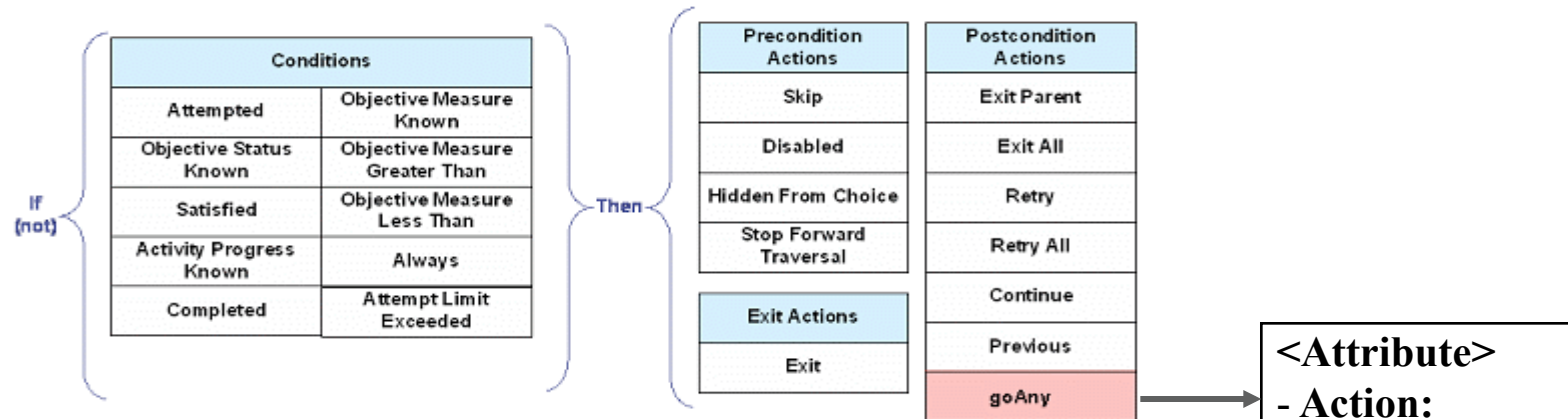
- **Jump control and auxiliary resource application**
 - Improvement in the efficiency of the manifest structure definition and enhancement of system performance
 - Plan for the sharing and distribution of contents including the auxiliary resource and diversification of the content types

- **Addition of support activity linked with the contents**
 - Proposed SCROM specification improvement to support the contents-linked support activity (also called collaborative learning activity)
 - Increased utilization of good digital educational resources in schools by allowing the definition of on-cum-offline lectures in manifest

- **Addition of simple competency linked with the contents**
 - Seeking the solution of sequencing and navigation using the result of the assessment system linked to systems outside LCMS

3-1. Jump Control and Auxiliary Resource Application

Flexibility of the contents structure using jump control



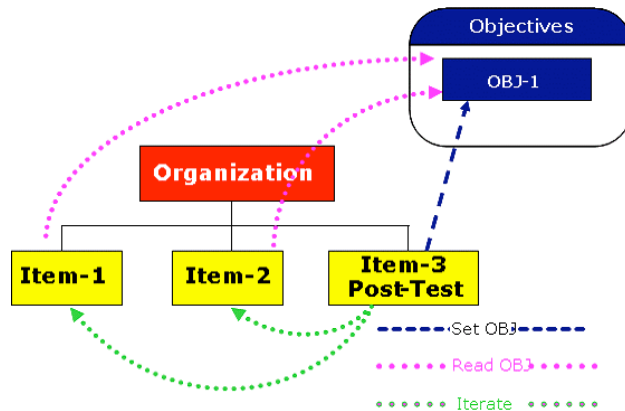
For example:

IF {Satisfied} THEN {goAny}

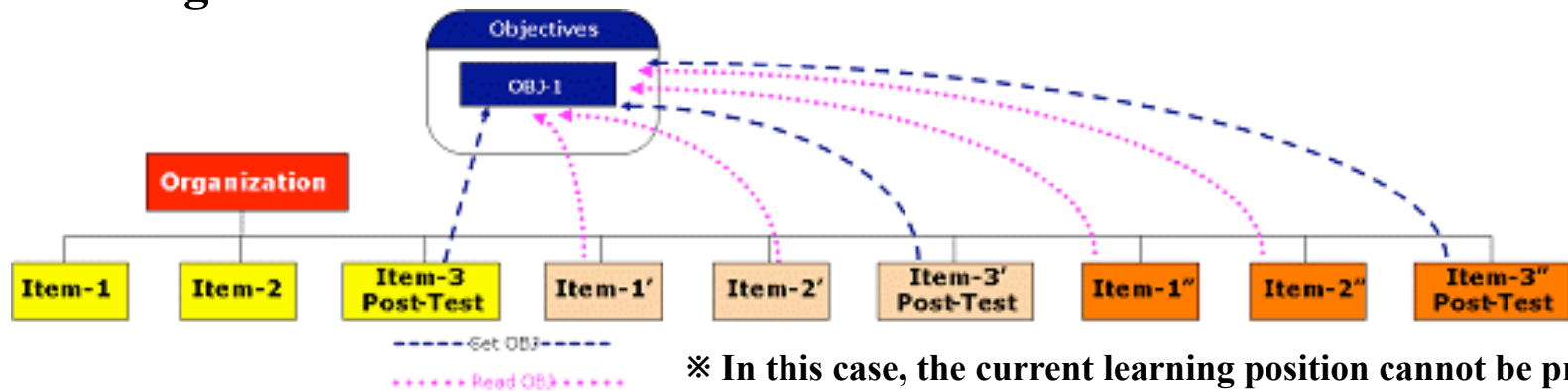
```
<imsss:sequencing>
  <imsss:sequencingRules>
    <imsss:postConditionRule>
      <imsss:ruleConditions>
        <imsss:ruleCondition condition="satisfied"/>
      </imsss:ruleConditions>
      <keris:ruleAction action="goAny" targetItemID="item-001"/>
    </imsss:postConditionRule>
  </imsss:sequencingRules>
</imsss:sequencing>
```

3-1. Jump Control and Auxiliary Resource Application

- Original lecture design and operation after the addition of jump control



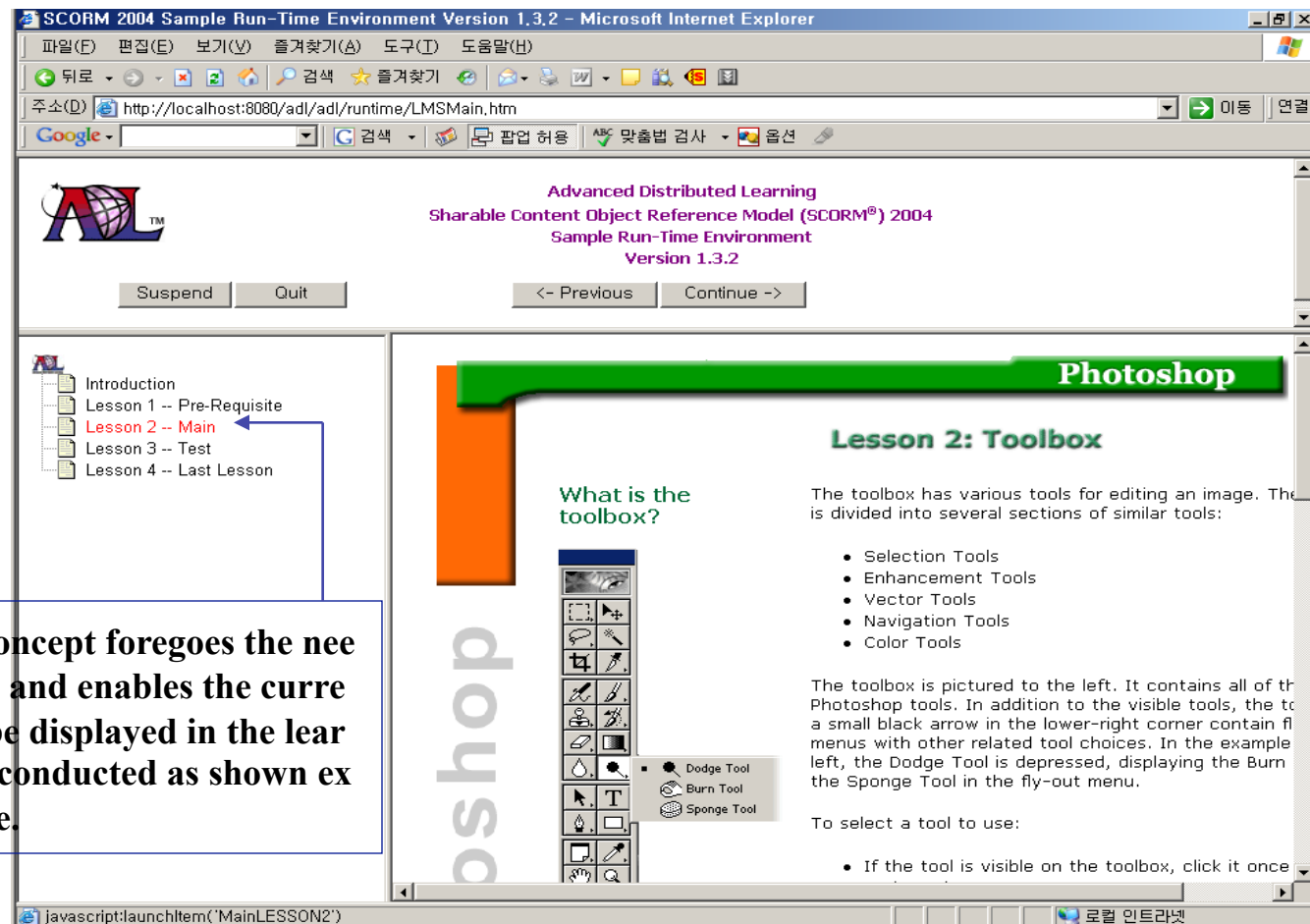
- Current structure for two time repeat under the current sequencing and navigation rule



※ In this case, the current learning position cannot be presented accurately in the LMS menu.

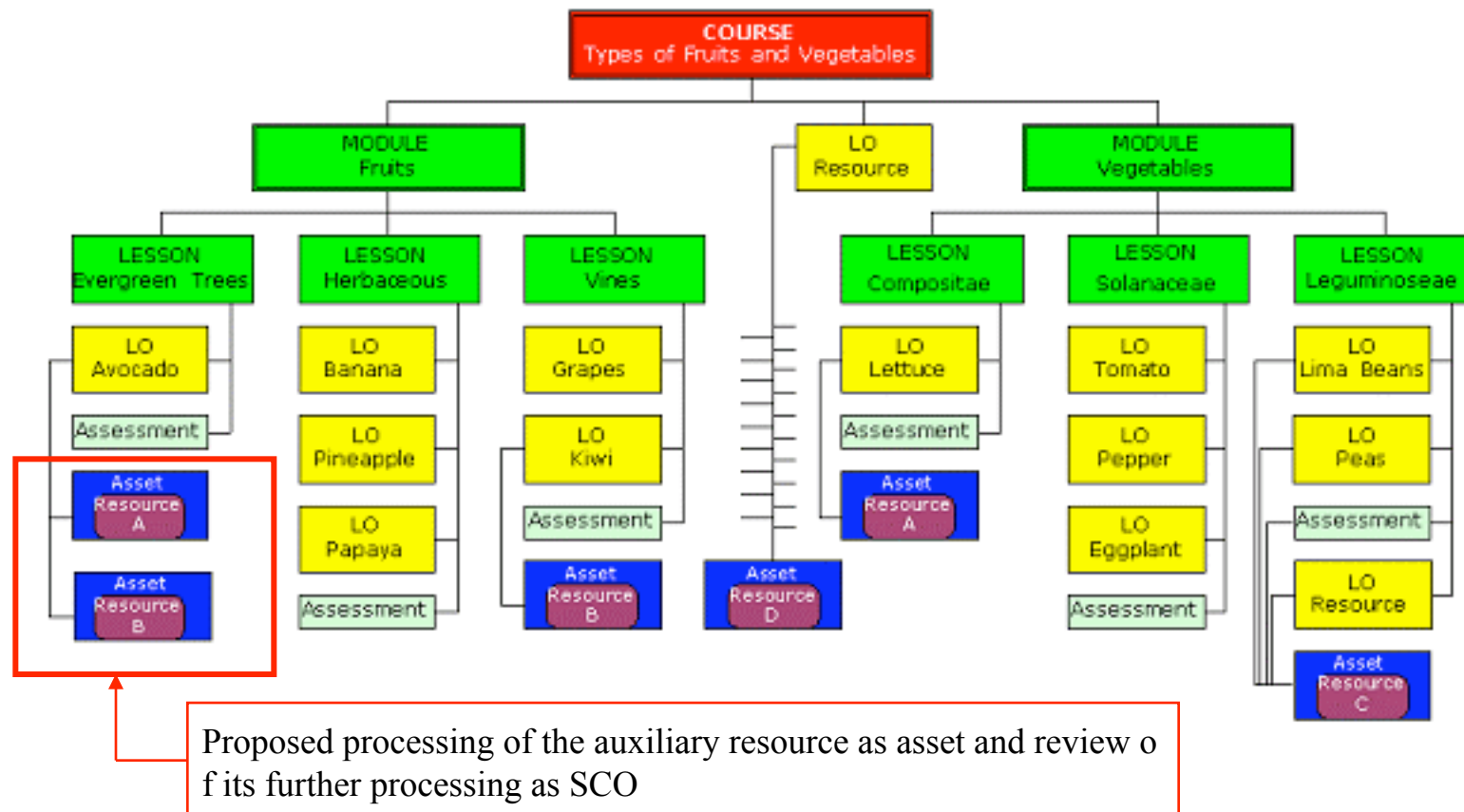
3-1. Jump Control and Auxiliary Resource Application

- Result of adding jump control by modifying the sample RTE



3-1. Jump Control and Auxiliary Resource Application

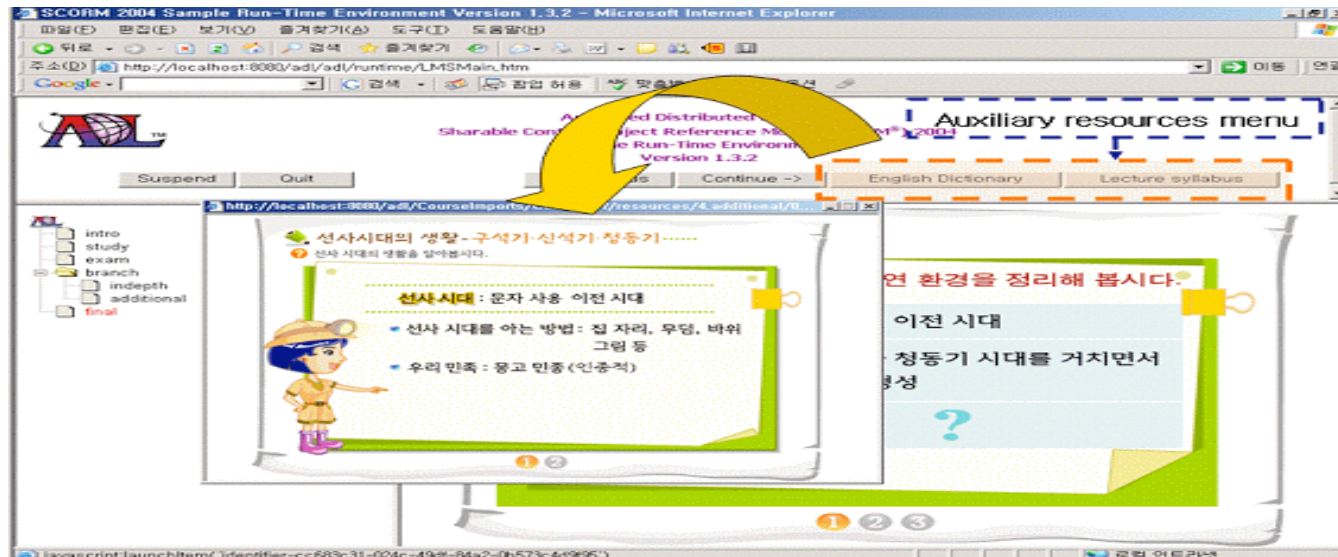
- Diversification of resource utilization with auxiliary resource



<Photo source: SCORM Best Practices Guide for Content Developers (1st Edition), LSAL (2004)>

3-1. Jump Control and Auxiliary Resource Application

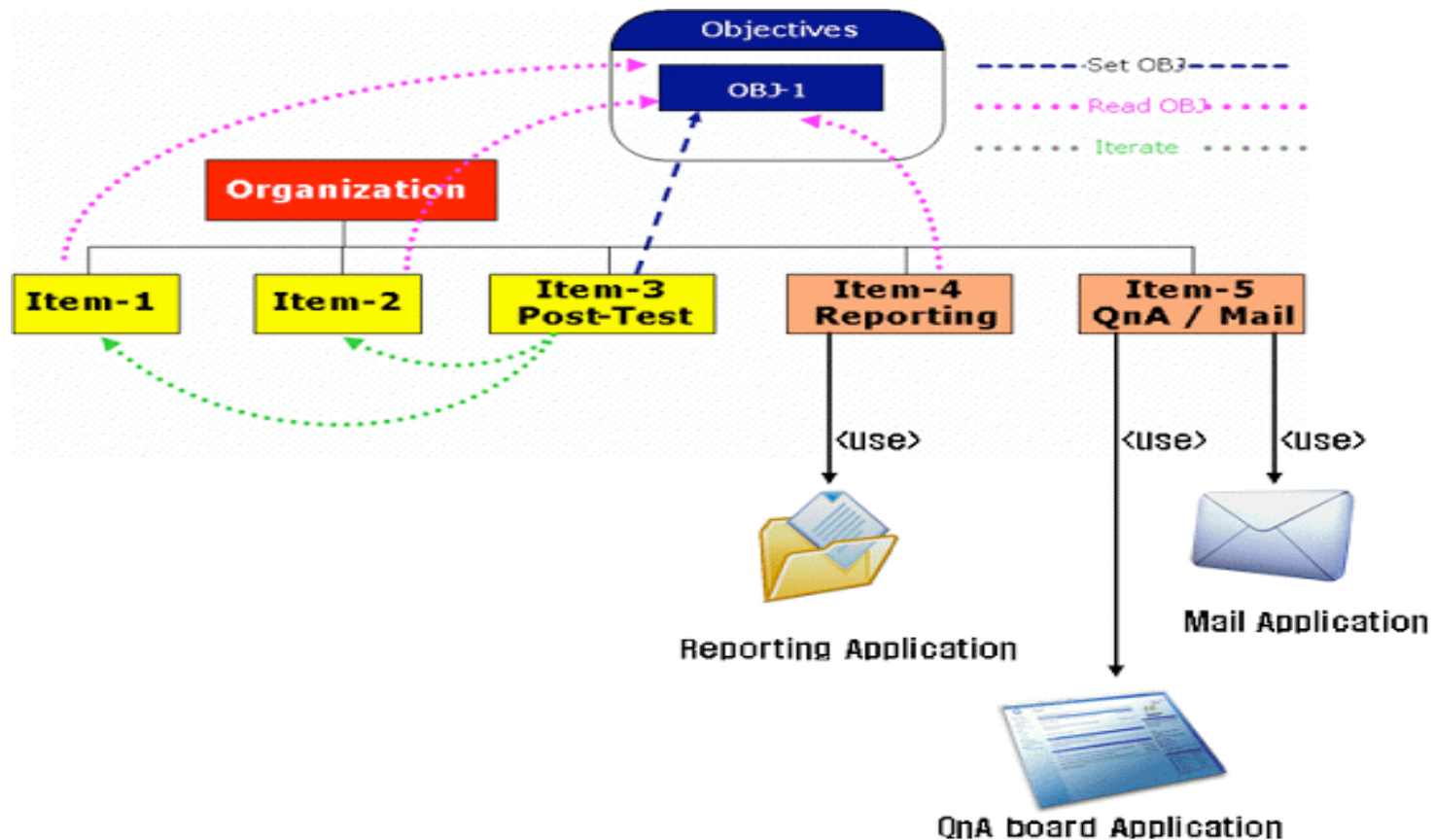
- Result of using auxiliary resource by modifying the sample RTE



```
<item identifier="item_id_01" identifierref="resource_id_01">
  <title>Content with Aux. Resources</title>
  <imsss:sequencing>
    <keris:auxResources>
      <keris:auxResource title="English Dictionary" identifier="aR-01" identifierref="aR-01-Resource"/>
      <keris:auxResource title="Syllabus" identifier="aR-02" identifierref="aR-02-Resource"/>
    </keris:auxResources>
  </imsss:sequencing>
</item>
```

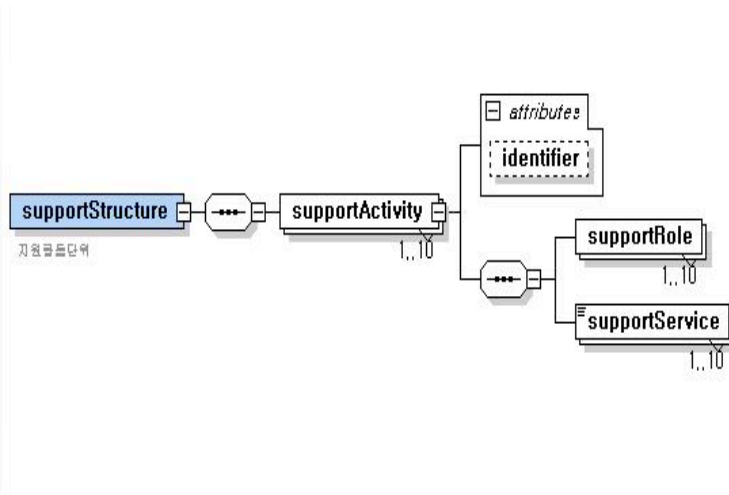
3-2. Addition of Contents-linked Support Activity

- Learning activity with added support activity



3-2. Addition of Contents-linked Support Activity

● Addition to the manifest structure



...Omitted...

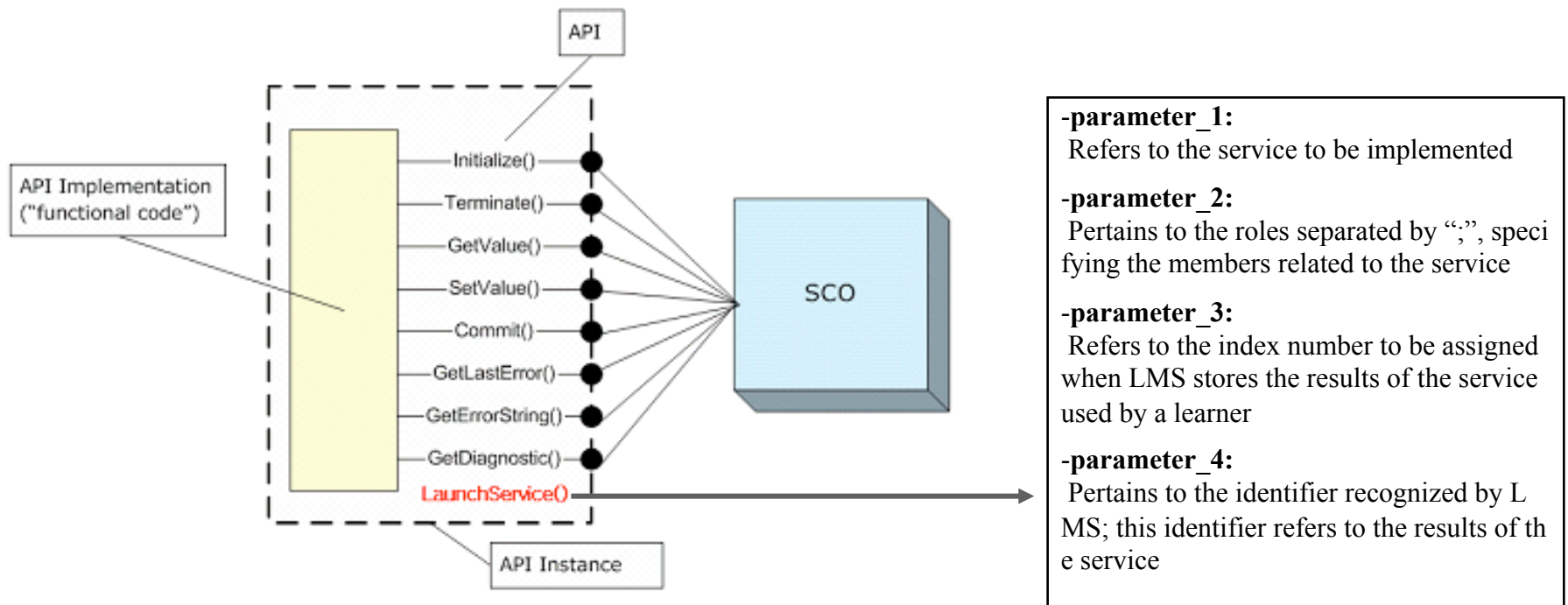
```

<item identifier="item_id_01" identifierref="resource_id_01">
  <title>Support Activity supported</title>
  <imsss:sequencing>
    <keris:supportStructure>
      <keris:supportActivity identifier="sa-001">
        <keris:supportRole>instructor</keris:supportRole>
        <keris:supportService>email</keris:supportService>
      </keris:supportActivity>
      <keris:supportActivity identifier="sa-002">
        <keris:supportService>qna board</keris:supportService>
      </keris:supportActivity>
      <keris:supportActivity identifier="sa-003">
        <keris:supportRole>instructor</keris:supportRole>
        <keris:supportRole>staff</keris:supportRole>
        <keris:supportService>report tool</keris:supportService>
      </keris:supportActivity>
    </keris:supportStructure>
  </item>
  
```

...Omitted...

3-2. Addition of Contents-linked Support Activity

● Addition to API



e.g., `return_value = LaunchService(parameter_1, parameter_2, parameter_3)`

<Photo source: SCORM Run-Time Environment version 1.3, ADL (2004)>

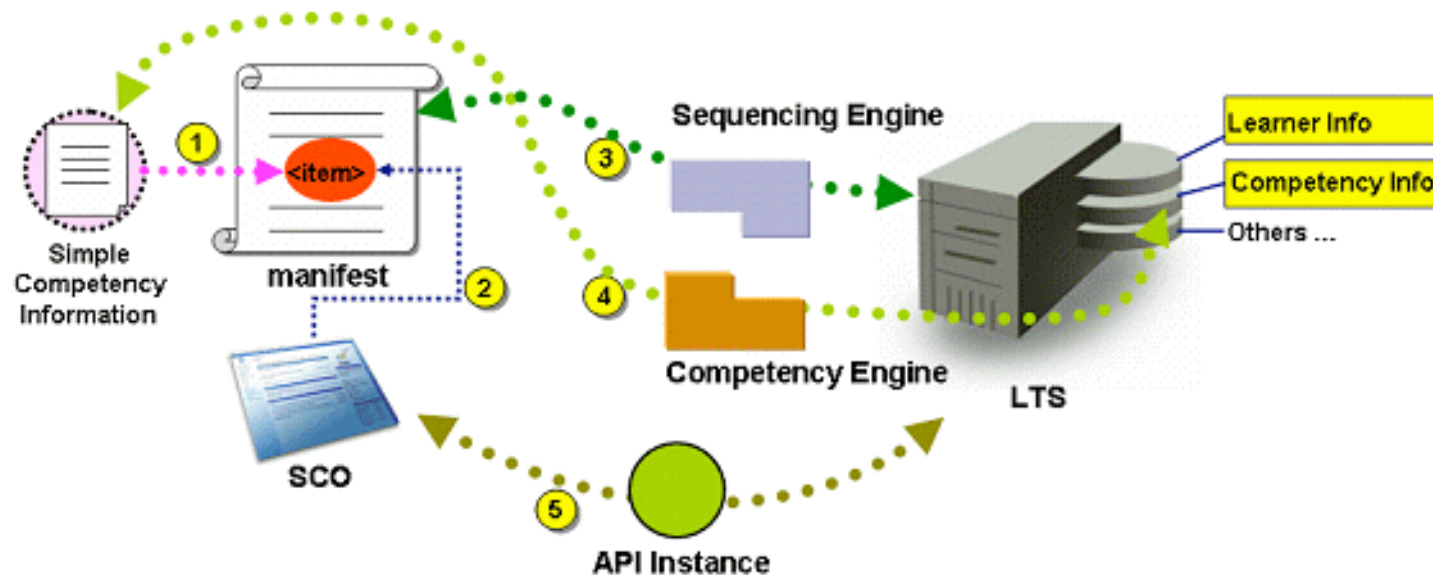
3-2. Addition of Contents-linked Support Activity

● Addition to the data model

No	Data Model	Examples
1	keris.supportactivity._count	GetValue("keris.supportactivity._count")
2	keris.supportactivity.n.id	GetValue("keris.supportactivity.0.id")
3	keris.supportactivity.n.role._count	GetValue("keris.supportactivity.n.role._count")
4	keris.supportactivity.n.role.n.type	GetValue("keris.supportactivity.n.role.n.type")
5	keris.supportactivity.n.role.n.type.instance._count	GetValue("keris.supportactivity.n.role.n.type.instance._count")
6	keris.supportactivity.n.role.n.type.instance.n.id	GetValue("keris.supportactivity.n.role.n.type.instance.n.id")
7	keris.supportactivity.n.role.n.type.instance.n.name	GetValue("keris.supportactivity.n.role.n.type.instance.n.name")
8	keris.supportactivity.n.role.n.type.instance.n.emailaddress	GetValue ("keris.supportactivity.n.role.n.type.instance.n.emailaddress")
9	keris.supportactivity.n.service.type	GetValue("keris.supportactivity.n.service.type")
10	keris.supportactivity.n.service.type.usage_status	GetValue("keris.supportactivity.n.service.type.usage_status") SetValue("keris.supportactivity.n.service.type.usage_status", "true") SetValue("keris.supportactivity.n.service.type.usage_status", "false")
11	keris.supportactivity.n.service.type.usage._count	GetValue("keris.supportactivity.n.service.type.usage._count")
12	keris.supportactivity.n.service.type.usage.n.i	GetValue("keris.supportactivity.n.service.type.usage.n.id")
13	keris.supportactivity.n.service.type.usage.n.date	GetValue("keris.supportactivity.n.service.type.usage.n.date")
14	keris.supportactivity.n.service.type.usage.n.title	GetValue("keris.supportactivity.n.service.type.usage.n.title")
15	keris.supportactivity.n.service.type.usage.n.score	GetValue("keris.supportactivity.n.service.type.usage.n.score")

3-3. Addition to Contents-linked Simple Competency

● Workflow of competency information (scenario)



- ① Simple competency information embedded as a `<competencyStructure>` sub-element under the leaf `<item>` element in the manifest file
- ② SCO (or asset in some cases) linked to the competency information-related `<item>`
- ③ When the learning paths defined in the manifest file are dynamically executed by the Sequencing Engine, thereby coming across
- ④ Leaf `<item>` defined in the competency information (refer to the next slide)
- ⑤ Contents linked to the `<item>` launched



3-3. Addition of Contents-linked Simple Competency

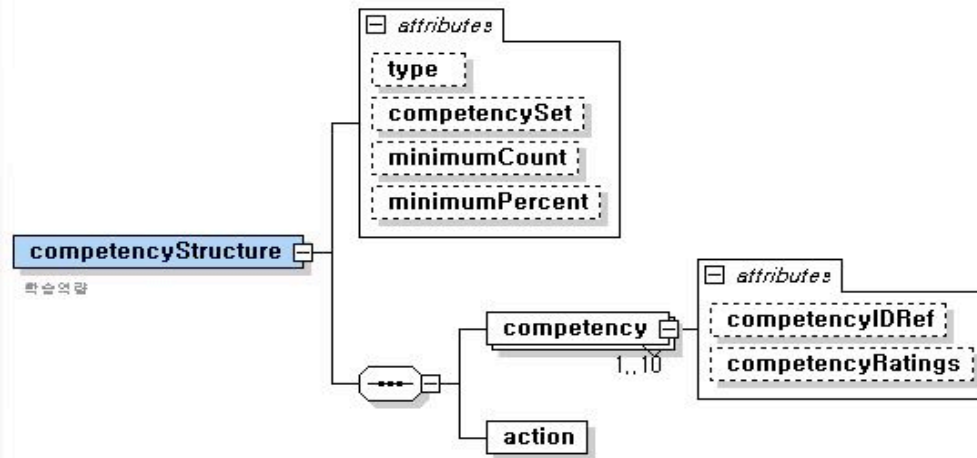
● Workflow of competency information (scenario)

④ Leaf <item> is defined in the competency information as follows:

- ④-1 The sequencing engine transfers the learning workflow execution authorization to the competency engine.
- ④-2 The competency engine analyzes the competency information to determine whether or not the <item> should be learned.
- ④-3 If the <item> needs to be learned, the competency engine transfers the execution authorization of the subsequent learning workflow to the sequencing engine with "continue" as the return value. The sequencing engine then conducts the learning according to its own sequencing rule. In this case, the learning of the <item> may be bypassed according to the sequencing rule, since the return value of "continue" does not mean that the SCO or asset linked to the <item> must be executed; instead, it suggests that the learning workflow execution authorization is transferred. When the contents are launched, the overall workflow continues on to "⑤" below; going back to "③" above if the contents are skipped by the sequencing engine.
- ④-4 If there is no need to learn the <item>, the competency engine transfers the execution authorization to the sequencing engine with "skip" as the return value. The sequencing engine then skips the <item> without processing the sequencing and launching the contents. In this case, the overall workflow goes back to "③" above.
- ④-5 If the competency engine transfers the learning workflow execution authorization to the sequencing engine without utilizing the competency information, the sequencing engine is called with "ignore" as the return value. In this case, the sequencing engine ignores competency information-related processing.

3-3. Addition of Contents-linked Simple Competency

● Addition to the manifest structure



...Omitted...

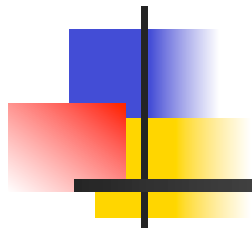
```

<item identifier="item_id_01" identifierref="resource_id_01">
  <title>Support Activity supported</title>
  <keris:competencyStructure type="active" competencySet="all">
    <keris:competency title="English Speaking" competencyIDRef="competency-001-01" competencyRatings="Excellent" />
    <keris:competency title="English Writing" competencyIDRef="competency-001-02" competencyRatings="Good" />
    <keris:action>continue</keris:action>
  </keris:competencyStructure>
  <imsss:sequencing>
</item>...Omitted...
  
```

3-3. Addition of Contents-linked Simple Competency

● Addition to the data model

No	Data Model	Examples
1	keris.competency.isable	GetValue("keris.competency.isable")
2	keris.competency.target_ids	GetValue("keris.competency.target_ids")
3	keris.competency.rating_up	SetValue("keris.competency.rating_up", "competency_id_001_01")
4	keris.competency.rating_down	SetValue("keris.competency.rating_down", "competency_id_001_01")



4. Conclusion



4. Conclusion and Future Research Directions

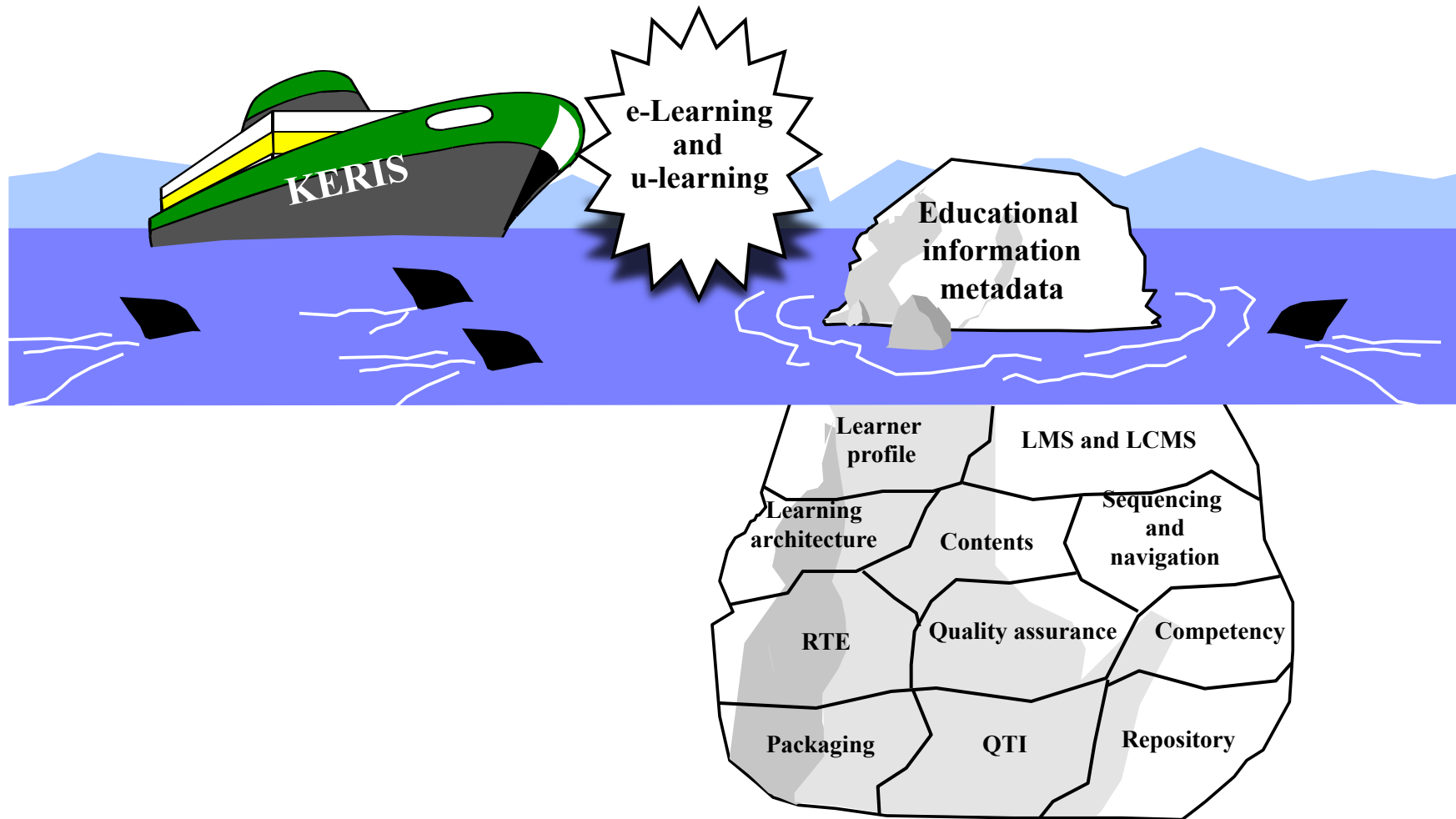
- **Best practice and sample RTE update**

- Development of best practice with added jump control and auxiliary resource
- Development of best practice and sample RTE with support activity function added
- Development of best practice and sample RTE with simple competency function added
- Research for application stage to the field and verification study of educational effectiveness

- **Need for innovative standardization study and case development**

- e-Learning system evolving into a complex system that organically links various functions and systems such as contents, users, assessment, and community, offering more complex contents such as game and simulation
- Need for e-Learning standardization specification to respond promptly to such development

KERIS's Standardization Efforts





Thank you very much.

Walking along this path by ourselves would be too lonely.

Would you care to join us?

- e-Learning Innovation Team, KERIS -